DEVELOPING REFLECTIVE THINKING AMONG PRE-SERVICE TEACHERS THROUGH MULTIPLE INTELLIGENCE TEACHING APPROACH (MITA)

Dr PK Sudheeshkumar

Reader

Dept of Education

University of Calicut

Kerala ,INDIA

Dr CM Bindhu

Selection Grade Lecturer

Farook Training College

Farook College PO

Kerala, INDIA

Being a skilful thinker in this new millennium is of paramount importance. A glance at the developments of information technology and the knowledge explosion phenomena would quickly convince as the need to be skilful thinker. One undeniably useful tool that could assist an individual in such venture will be none other than the *Reflective Thinking* and *Critical Thinking* skills. Therefore, the next important task for educators is to instil these invaluable thinking skills in to our students. For this it is better to possess reflective thinking skills among teachers. One of Dewey's basic assumptions was that learning improves to the degree that it arises out of the process of reflection **(Dewey, 1933)**. Reflection arises because the organism detects the appearance of incompatible factors within a situation than develops opposed responses in an attempt to further engage in and understand the situation, thereby constructing knowledge. Knowledge is constructed, in part, through reflection. Knowing therefore is not a process of registration or representation, but one of intervention.

NEED AND SIGNIFICANCE OF THE STUDY

Dewey considered that reflection involves an integration of *attitudes* and *skills,* in methods of inquiry, that neither attitudes nor skills alone will suffice. Reflection is an important human activity in which people *recapture their experience*, think about it, mull it over and evaluate it. It is a form of response of learner to experience. Reflective thinking helps learners to develop higher-order thinking skills by prompting learners to relate new knowledge to prior

understanding; think in both abstract and contextual terms; apply specific strategies in novel tasks and understand their own thinking and learning strategies. In the last two decades teacher education programmes have increasingly focused on reflection as an important aspect of teacher formation. The general concept of teacher reflection dates back to John Dewey's encouragement for teachers to examine the underlying rationale for their choices. He identified three attributes for reflective teachers- *Open-mindedness, Responsibility* and *Whole heartedness.* Reflection is important in encouraging educators to explore the integration of new educational technologies into their current teaching practices to reduce the perception of incompatibility. Such reflections prompt educators to face personal and environmental constraints, incrementally develop new practices that led to successful implementation and successful practice **(Collis, 1996; Dias, 1999; Ertmer, 2003).**

In the 1980's Harvard University psychologist, **Howard Gardner(1983)** had a pluralistic view of the mind, and recognized the many discrete facets of cognition. Gardner found that his own research interests were leading him to a heightened concern with issues of human intelligence. This concern grew out of two disparate factors, one primarily *theoretical* and other largely *practical.* Gardner defines *Intelligence as the ability to solve problems or to fashion products that are value in one or more cultural settings.* To engage diverse students actively in higher education classes is to understand and interact with their unique worlds. When lessons do not accommodate students' interests and abilities as tools to achieve, learners lose interest and feel disengaged. The **Multiple Intelligence Teaching Approach** (MITA) model is applied to resolve problems of student passivity in higher education classes. MITA can help more students in diverse populations to solve complex problems in authentic learning situations **(Webber, 2001)**. MITA incorporates Howard Gardner's wider family of 11 intelligences and relies on the human brains optimum potential for success.

MITA has the following features, such as **1)**It start with a question or problem to generate curiosity and wonder for deeper understanding of complex

issues; **2)** Faculty functions as facilitators rather than administers of facts;**3)** Learning outcome is holistic rather than narrowly based in any one discipline; and **4)**Assessments are Faculty functions as facilitators rather than administers of facts; **5)** Learning outcome is holistic rather than narrowly based in any one discipline; **6)** Assessments are authentic, performance based and varied according to the outcomes required to solve particular problems. MITA offers catalytic practices through five phases, through which Students discover inner interests and abilities that promote learning success. MITA's five implementation phases evolved from a vision for deeper inquiry and a quest for diversified approaches to identify problems and plan solutions. They are **Phase-I Questions for Curiosity and Wonder**, **Phase-II   Learning Objectives for Focus and Vision, Phase-III Rubrics for Accuracy and Fairness, Phase-IV Multiple Assessment** and **Phase-V Reflection for Ongoing Reward.**

The investigator had done an extensive review in the field related to Reflective Thinking and Multiple Intelligence Teaching Approach. The studies concerned with Reflective Thinking show that Reflective Thinking can be developed through different strategies such as journal writing, autobiographies, microteaching, clinical supervision, classroom video analysis, instructional and field activities, action research projects, case and cultural studies, practical experiences, structured curriculum tasks, oral interviews, reading fiction and non-fiction, reflective essay, guided monitoring of the writing process, inquiry and explanation oriented instructional methods, video stimulated reflective dialogue etc. MITA has been experimentally proved by various psycho –educational researchers as a strategy of instruction for the development of reflective thinking skills in varied educational set up **(Karen, 2001; MCkenzie, 2002; Campbell,2003; Ribot,2004 & Webber,2005)**.these studies show that, there are much advantages in human personality by using Multiple Intelligences in classrooms and in higher education such as students learn to ask researchable questions, identified varied resources, create realistic time lives, initiate, implement and bring closure to a learning activity, prepare students for their adult lives, interacting actively with the content and concepts they are studying, active

in planning and assessing learning process, increase self-confidence identify personal strengths, enthusiastic etc.

From the literature reviewed by the investigator, it is clear that prompting Reflective Thinking is very important. Good Reflective Thinking is a more encompassing process, where by an individual aware of his own knowledge and the gaps in his knowledge, assumptions and past experiences. Reflective Thinking provides skills to mentally process learning experiences, identify what they learned, modify their understanding based on new information and experiences and transfer their learning to other situations. So the investigator found relevance in such a study focussed on teacher trainees to examine how effective MITA in the development of reflective thinking. The study was carried out within the frame of a **controlled experiment.**

OBJECTIVE & HYPOTHESIS

The study is designed with a view to examine the effectiveness of Multiple Intelligence Teaching Approach in the development of Reflective Thinking among Pre-service teachers**.** The investigator hypothesised that *Pre-Service Teachers taught through Multiple Intelligence Teaching Approach will not differ significantly in the development of Reflective Thinking than Pre-Service Teachers taught through Existing Method of Teaching.*

DESIGN OF THE STUDY

The Pre test-Post test Equivalent - Group design was selected for the study. This design provides a blue print for experimentation. Experimentation provides a method of hypothesis testing. It helps the researchers to reach valid conclusions about the relationship between Dependent and Independent variables **(Best & Khan,2006).** The design is illustrated as follows:

G_1 O_1 X O_2

G_2 O_3 C O_4

Where G_1 = Experimental group, G_2 = Control group, X = Application of experimental treatment, C = Application of control treatment., O_1, O_3 = Pre tests O_2, O_4 = Post tests, and

$$\left.\begin{array}{l} O_2 - O_1 \\ O_4 - O_3 \end{array}\right\} \quad = \text{ Gain scores}$$

VARIABLES

In the present study, Teaching Approach is the independent variable. It has two levels such as **Multiple Intelligence Teaching Appraoch (MITA)** and **Existing teaching Method.of teaching.** The dependent variable of the present study is **Reflective Thinking**. It includes nine components- *Content Reflection, Process Reflection, Premise Reflection, Habitual action, Thoughtful action, Introspection, Pre-Reflective Thinking, Quasi-Reflective Thinking and Reflective Thinking*

Since it was a controlled experiment the variables controlled for the present study were – the **initial status** of pupils with reference to Reflective Thinking measured by a pre test; **Learning style; Approaches to study; Verbal intelligence; Non-verbal intelligence; Classroom Environment** and **Socio-Economic Status** of pupils. These variables were controlled with an assumption that these factors may have substantial influence in the reflective thinking skills of the sample.

In the present study Multiple Intelligence Teaching Approach (MITA) is taken as the Treatment Variable.

The Sample

The sample for present study was pre-service teachers. Two **intact** groups of Pre-service first year teachers were selected from two District Institutes of Education and Training (DIET) as Experimental and Control Groups.

Selection of the Topics

Topics for the treatment was selected from the Biology syllabus, prescribed for standard VIII, IX and X pupils of Kerala state.In the syllabus of first

year Trained Teachers Certificate Course (TTC), the Basic Science includes the topics which are same that prescribed for the standard VIII, IX and X classes of Kerala state.   So the investigator decided to take those topics. The topics included are **a)**   Food Chain, **b)**   Ecosystem, **c)**   Nitrogen cycle, **d)** Photosynthesis, **e)** Genetics, **f)**   Respiration, **g)**   Reproduction, **h)**   Structure of Animal cell.

The same topics were taught to the teachers of both Experimental and Control Groups. Both groups were taught for about thirty periods of one hour duration. So both groups were taught for about Thirty hours.

TOOLS USED FOR MEASUREMENT

In the present study the dependent variable - Reflective Thinking was measured by using Integrated Reflective Thinking indicator- IRTI **(Kumar & Deepa, 2005)**. Control variables were measured by using standardized tools. A brief description of the tools used as follows.

Integrated Reflective Thinking Indicator (IRTI)

For the present study Reflective Thinking is the dependent variable and to measure this variable no appropriate tool was available.   Hence the investigator developed a scale on Reflective Thinking **(Kumar & Deepa, 2006).**

The scale is based on nine components, namely - Content Reflection, Process Reflection, Premise Reflection, Habitual action, Thoughtful action, Introspection, Pre-Reflective Thinking, Quasi-Reflective Thinking and Reflective Thinking. The scale consisted of 72 items from nine components and for each components prepared four positive items and four negative items.   Total constituted 36 positive and 36 negative items.

Statements are so framed and five possible responses were **Definitely Agree, Agree, Neither Agree Nor Disagree, Disagree and Definitely disagree.** The respondent have to put 'X' mark on the separate response sheet, which seems to be correct for them.The scoring procedure was 5, 4, 3, 2, 1 for

the positive items and 1, 2, 3, 4, 5 for negative items to the responses. All items are in English with a maximum score of 360 and minimum score of 72. Among this 16 were positive and 18 were negative statements. Reliability of IRTI was established using the split-half method and found to be 0.79. For establishing validity of the Indicator criterion related technique is used with *Reflection Questionnaire* **(Kember, *et al.*, 2000)** was taken as the external criterion and found as 0.63.

Lesson Transcript for Multiple Intelligence Teaching Approach (MITA)

The investigator prepared lesson transcripts for Multiple Intelligence Teaching Approach as per the directions of **Webber (2001).** The learning experiences were given to the experimental group was for acquiring the eleven multiple intelligences. The lesson transcripts were based on the five phases of Multiple Intelligence Teaching Approach.

Lesson transcript for Existing Method of Teaching

Existing Method of Teaching refers to the method of teaching utilized for transacting the new curriculum which is learner centred and process oriented introduced by the Government of Kerala in the high school classes The existing mode of instruction is based on the theories of **Cognitive Constructivism**-Bruner, **Social Constructivism**-Vygotski and **Multiple Intelligence Theory** of Howard Gardner. Lesson Transcripts for the Existing Method and Teaching have been prepared by the investigator.

Learning Style Inventory (LSI)

The Learning Style Inventory developed and standardised by **Kumar *et al.* (1996)** was used for measuring the learning style of the sample. The Inventory was based on Dunn and Dunn model **(Dunn, *et al.*, 1979)** of Learning Style and Productivity Environment Preference Survey. Validity and reliability are 0.62 and 0.64 respectively.

Approaches to Studying Inventory (ASI)

Approaches to Studying Inventory, constructed by and standardized by **Kumar** and **Das (2001)** was used to measure the control variable Approaches to study of the sample. The inventory has 4 dimensions such as Meaning orientation, Reproducing orientation, Achieving orientation and Non-Academic Orientation. Validity is 0.60 and reliability is 0.73.

Verbal Group Test of Intelligence (VGTI)

Verbal Group Test of Intelligence which was developed and standardized by **Kumar, *et al*. (1997)** is used in this study for measuring the control variable Verbal Intelligence. The test battery consists of five sub tests, namely Verbal Analogy, Verbal Classification, Numerical Reasoning, Verbal Reasoning and Comprehension. Each subtest consists of twenty items. The duration of the test is one hour. Content validity was established by the test constructors and test – retest reliability is as reported by the test constructors is 0.82.

Standard Progressive Matrices Test (SPM)

Standard Progressive Matrices Test developed by **Raven (1950)** was used to measure the control variable Non-verbal Intelligence in the present study.It has the validity of 0.86 and reliability as 0.88.

Classroom Environment Inventory (CEI)

The control variable Classroom Environment was measured by using Classroom Environment Inventory **(Aruna,*etal*.1997)** The inventory has 12 dimensions, namely, Material Environment, Cohesiveness, Test Orientation, Innovation, Participation, Teacher Support, Personalization, Independence, Order and organization, Teacher Control, Friction and Competition. The inventory has a validity 0.54 and reliability 0.85.

General data sheet for Assessing Socio-Economic Status (SES)

To assess the control variable, Socio-Economic Status of students, General data sheet was used. This data sheet includes, information regarding income, education and occupation of both parents.

The whole procedure of experimentation and data collection is described as follows.

Administration of Pre test

Before starting the experiment, both the Experimental and Control Groups were given the same pre-test to measure the initial status of the subjects with reference to Reflective Thinking, using Integrated Reflective Thinking Indicator as a pre test.

Experimental Treatment

The Experimental Group was taught through Multiple Intelligence Teaching Approach (MITA) for 30 periods of one hour duration, on the basis of the lesson transcripts already prepared.

Control Treatment

The Control Group was taught through the Existing Method of Teaching. The treatment was extended for 30 periods of duration one hour, on the basis of the lesson already prepared.

Administration of Post Test

After the completion of the treatment, the same Integrated Reflective Thinking Indicator (IRTI) was given to both the Experimental and Control Groups, as a post test. in order to measure the final status of the subjects after the experiment with reference to Reflective Thinking.

Administration of Other Tools

During the time of Experiment, the investigator administered all other tools, such as Learning Style Inventory, Approaches to Studying Inventory, Verbal Group Test of Intelligence, Standard Progressive Matrices Test, Classroom Environment Inventory and General data sheet for Socio-Economic Status on both the Experimental and Control Groups.

Statistical Techniques Employed

In order to control statistically, the difference in the initial status and other intervening variables, **Analysis of Covariance** was used. It was also helpful to remove the effect of control variables and to confirm the effectiveness of Multiple Intelligence Teaching Approach on the development of Reflective Thinking. So that this permits a valued evaluation of the outcome of the experiment.

After ANCOVA, **Scheffe (1959)** test was used as a technique of post-hoc comparison of the adjusted criterion means of the Experimental and Control Groups to determine the group difference. This was done with the significant F values obtained in ANCOVA.

Equivalence of the Experimental and Control Groups

Since the design employed for the study was pre test - post test equivalent group design, it is necessary to establish equivalence of the experimental and control groups. Equivalence is ascertained by t-test for Mean scores of these variables. ANCOVA is a best statistical method to adjust this small pre-existing difference among the intact groups and ANCOVA may remove bias attributable to the intact groups. The use of ANCOVA may result in the same benefit as in a completely randomized experiment, that it increases the precision of the experiment by reducing the error variance **(Wildt & Ahtola , 1978)** .

ANALYSIS & INTERPRETATIONS

For studying the effectiveness of Multiple Intelligence Teaching Approach on the Development of Reflective Thinking among Pre service teachers Single Factor ANCOVA with seven covariates in combination is employed. Multiple Intelligence Teaching Approach (MITA) and Existing Method as two levels of independent variable were incorporated with seven covariates.

Before proceeding to ANCOVA, the data for analysis is subjected to thorough examination and seen satisfied with the major assumptions **(Wildt & Ahtola; 1978)** to carryover **ANCOVA .**

Single Factor ANCOVA using Seven Covariates in Combination

Single factor ANCOVA with seven covariates in combination at a time is used to examine the effectiveness of Multiple Intelligence Teaching Approach on the development of Reflective Thinking among Pre-service teachers. Results of ANCOVA is summarised in Table 1.

TABLE 1.

**Summary of Single Factor ANCOVA for
Development of Reflective Thinking Using Seven Covariates**

Sl. No.	Source of variation	Sum of squares	df	Mean square variance	F-value	Level of signi-ficance
1.	Group	459.42	1	459.42		
					42.01	0.01
2.	Within cells	678.01	62	10.94		
	Total	1137.43	63			

As per Table1. the obtained F-value for the treatment variable is found well beyond the tabled value (6.85) set for 0.01 level of significance and therefore significant at 0.01 level (df1,62). The result suggests that there exists statistically significant difference between the two groups even after making a linear adjustment to remove the combined effect of the seven covariates at a time.

To know which group Experimental or Control, causes difference from another in terms of the variation in the criterion mean. Scheffe' test of post-hoc comparison was made with the adjusted criterion mean for the experimental and control groups on significant F values. Result of post-hoc comparison is presented in Table 2.

TABLE 2.

Result of the Scheffe' Test of Post-hoc Comparison
between the Adjusted Means of Experimental and Control Groups

Sample	N	Dependent Variable	Groups compared	Means		F-value	Value of F'		Level of Significance
				M₁	**M₂**		**0.05**	**0.01**	
Total	71	Reflective Thinking	Experimental & Control	118.9935	113.16717	55.06	3.92	6.85	0.01

As per Table2 the obtained F-value for the comparison between the experimental and control group is 55.06. The corresponding F-value is found greater than the value of F' required for significant for both 0.05 and 0.01 level. It can be inferred from the result that, significant difference in the development of Reflective Thinking is evident between the two groups. The result indicates the advantage of Experimental Group over Control Group due to high mean score of the Experimental group to which MITA is applied. The observed difference in the Reflective thinking score of the Experimental and Control groups substantiates

the effectiveness of Multiple Intelligence Teaching Approach in the development of Reflective Thinking of pre-service teachers.

From the significant F- value obtained after ANCOVA, it is clear that the Experimental group had got higher Scores in relation to the development of Reflective Thinking. Scheffe' Test of Post- hoc comparison also revealed the effectiveness of MITA on the development of Reflective Thinking in case of Experimental Group. So it is clear that Pre service Teachers taught through MITA differs significantly than Pre service Teachers taught through Existing Method of Teaching. Hence the hypothesis tested by this experiment is *rejected*.

Practical Applications

MITA is helpful for developing deeper inquiry and a quest for diversified approaches to identify problems and plan solutions . Reflection is a regular commitment of a MITA lesson . A typical MITA lesson opens with key questions and presents real life problems. Each MITA lesson concludes with reflections that motivate ongoing and transformative investigations about the student, the lesson and the methods . In MITA classes, reflection involves new information about the brain's power to optimize each person's ability to perform well through reflection.

MITA adds practical response to brain compatible learning recommendations to higher education . The model is brain compatible in that each of the model's five phases relate to significant facts about brain capacity. The model's first phase responds to the facts that search for meaning is innate in human brain. Phase two, responds to the fact that learning is enhanced by challenge and inhibited by threat . Phase three, of the MITA model, responds to the facts that learning is developmental. Phase four, responds to the fact that each human brain is unequally wired and different from other brains. Phase five responds to the fact that brain / mind is a complex dynamic system. In Pre service education Reflective Thinking is an important aspect, because successful professionals need to reflect upon their actions as most tasks they perform involve novel elements to which there are no defined solutions. So courses

educating professionals should aim to develop students' abilities to reflect upon their actions. From this study it can be revealed that Multiple Intelligence Teaching Approach is very useful and effective for developing Reflective Thinking among Pre service Teachers. So MITA should be included in the curriculum of Pre service education as a teaching strategy.

References

Aruna, P.K., Suresan, K. & Unnikrishnan, M. (1997). *Classroom Environment Inventory*. Calicut: Department of Education, University of Calicut

Best, J.W. & Kahn, J.V. (2006). *Research in education*. (10th ed.). Boston: Pearson Education Inc.

Campbell, B. (2003). *Multiple intelligences reaches the tibetal children's village.* Retrieved January, 2003, From http://www.newhorizons.org/index.html.

Collis, B. (1996). The internet as an educational innovation: Lesson from experience with computer implementation. *Educational Technology,* **36**, 21-30.

Dewey, J. (1993). How we think: A restatement of the relation of reflective thinking to the educative process. Boston: D.C. Health..

Dias, L.B. (1999). Integrating technology. *Learning and Leading with Technology,* **27**, 10-13.

Dunn, R., Dunn, K. & Price, G. (1979). *The learning Style Inventory.* Lawrence K.S.: Price Systems Inc.

Ertmer, P. (2003). Transforming teacher education: Visions and strategies. *Education Technology Research and Development,* **51**, 124-128.

Gardner, H. (1999). *Intelligence reframed: Multiple intelligences for the 21st century.* New York: Basic Books.

Karen, R. (2001). *Using multiple intelligences to enhance learning.* Retrieved October 2001 from http.//www.Karen.M1/personnel/Html.

Kember, D., Leung, D.Y.P., Jones, A., Loke, A.Y., Mckay, J., Sinclair, K., Tse, H., Webb, C., Wong, F.K.Y., Wong, M., & Yeung, E. (2000). Development of a questionnaire to measure the level of reflective thinking. *Assessment and Evaluation in Higher Education,* **25,** 232-395.

Kumar, S.P.K & Das, S.K.K. (2001). *Approaches to studying inventory.* Calicut: Department of Education, University of Calicut.

Kumar, S.P.K & Deepa, C.G. (2005). *Integrated reflective thinking indicator.* Calicut: Department of Education, University of Calicut.

Kumar, S.P.K., Hameed, A. & Prasanna, A. (1997). *Verbal group test of intelligence.* Calicut: Department of Education, University of Calicut.

Kumar, S.P.K., Preetha, S., Rehna, E.T., & Sathy, P. (1996). *Learning Style Inventory.* Calicut: Department of Education, University of Calicut.

Mckenzie, W. (2002). *MI.JT and Standards: The Story of Jamie.* Retrieved September 2002, from http://www.surfequarium.com/tj.htm.

Raven, J.C. (1958). *Standard Progressive Matrices sets A, B, C, D and E.* London: M.K. Lewis and Coll. Ltd.

Ribot, N. (2004). *My experiences using the multiple intelligences.* Retrieved March 2004, from http://www.newhorizons.org/.

Scheffe, H. (1959). *The analysis of variance.* New York: John Wiley & Sons. Inc.

Webber, E. (2001). *Five phases to pBL: MITA (Multiple Intelligence Teaching Approach)* model for redesigned higher education classes. Retrieved April, 2001, From http://www.newhorizons.org/ strategies/mi/weber.3htm.

Webber, E. (2005). *Multiple intelligence Strategies in the classroom and beyond using Round table learning.* Retrieved September 2005, From http://www.horizons.org/.

Wildt, A.R. & Ahtola, D.T. (1978). *Quantitative applications in the social sciences series: Vol. 12. Analysis of Covariance.* Neurburg Park, California: Sage Publications.

Winer, B.J. (1962). *Statistical principles in experimental design* (2nd ed.). Tokyo: McGraw Hill Kogakusha.